Remarks

Claims 1 – 11 are pending in the present application. Claims 1 – 11 were rejected in the final rejection mailed on January 17, 2006. Claims 1 – 11 are hereby cancelled in this response and replaced with new claims 12 – 20.

New claims 12 – 20 have been added to the present application. Support for new claim 12 is found throughout the application, including page 1, lines 14 – 16, page 4, lines 14 – 17 and Example 6. Support for new claim 17 is found on page 8, lines 12 – 15. Support for new claim 20 is found on page 7, lines 14 – 16. The remainder of the claims incorporate substantially similar subject matter to cancelled claims 1 – 11.

Claims 1 – 2, 4 and 11 were rejected as anticipated under 35 U.S.C. 102(a) over U.S. Patent No. 5,827,608, issued to Rinchart. Claims 1 – 2, 4 and 11 have been cancelled. New independent claim 12 contains substantially similar subject matter to cancelled claim 5, which was not anticipated by Rinchart. Accordingly, new claim 12 and its dependent claims 13 – 20 are not anticipated under 35 U.S.C. 102(a) by Rinchart.

Claims 1 – 2, 4 – 5, 7 – 8 and 10 – 11 were rejected as unpatentable under 35 U.S.C. 102(b) over U.S. Patent No. 4,859,266, issued to Akasaki. Claims 1 – 2, 4 – 5, 7 – 8 and 10 – 11 have been cancelled. Akasaki describes a method and apparatus for powders sewing two plies of cloth or fabric material (abstract, first two lines). The powder is a Nylon copolymer of Nylon 6, 66 and 12 (column 5, line 24) and the operating conditions are 140 to 160°C (column 5, lines 33-34). The glass transition temperatures of the Nylons utilized are above 40°C (see attached table from Aldrich). The new independent claim 12 is limited to substrates wherein at least one substrate is paper or plastic (see page 1, lines 14 - 16, and, if said powder adhesive formulation is activated by heat, the heat temperature being up to 120°C (see Example 6). Furthermore, if the inventive polymers are synthetic polymer, they contain functional monomers and/ or have a glass temperature Tg of between -60 and +40°C (see page 4, lines 14 - 17). Accordingly, there are significant differences between the disclosures of the present invention and Akasaki. In view of these differences it is respectfully submitted that the claims of the present invention are patentable under 35 U.S.C. 102(b) over Akasaki.

Claims 1 – 2, 4 – 5 and 7 – 11 were rejected as anticipated under 35 U.S.C. 102(b) by U.S. Patent No. 4,496,415, issued to Sprengling. Claim 1 – 2, 4 – 5 and 7 – 11 have been cancelled. Sprengling describes the use of phenolic resin powder (see Abstract, second line) and applies heat at 140°C (column 6, line 53), 170°C (column 6, line 17) and the roller temperatures can even be up to about 250°C (column 5, line 20).   However, the present invention works at much lower temperatures (up to 120°C). Furthermore, if the polymer is a synthetic polymer, it contains functional monomers and/ or has a glass temperature T_g of between -60 and +40°C, which is both not the case for phenolic resin powder. In view of these significant differences, it is

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respectfully submitted that the claims of the present invention are patentable under 35 U.S.C. 102(b) over Sprengling.

Claims 1 – 2 and 4 – 11 were rejected as anticipated under 35 U.S.C. 102(b) by WO 03/076083 to Maijala. Claims 1 – 2 and 4 – 11 have been cancelled. Maijala describes a method for forming a film on a planar surface (page 1, lines 4-5). In addition to the differences between Maijala and the present application described in Applicants response mailed December 14, 2005, it is essential that the supply air temperature in Maijala is lower than the glass transition temperature of the polymer ($T_{air} < T_g$; see page 12, lines 24 – 27). However, in the present invention, this certainly is not true, since the Tg of the polymers can be down to -60°C. Furthermore, very often the operating temperature can exceed the upper limit of the glass transition temperature, which is +40°C. Accordingly, in view of these differences it is respectfully submitted that the claims of the present invention are patentable under 35 U.S.C. 102(b) over Maijala.

Claim 11 was rejected as anticipated under 35 U.S.C. 102(b) by U.S. Patent No. 5,928,721, issued to Parker. Claim 11 has been cancelled and its subject matter has not been substantially incorporated into any of the new claims.
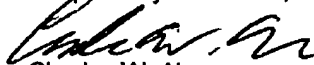
Claims 5 and 7 – 10 were rejected as unpatentable under 35 U.S.C. 103(a) over Rinchart. Claims 5 and 7 – 10 have been cancelled. Rinchart describes a method of forming a thermoplastic layer on a flexible, two-dimensional substrate (see abstract, first two lines). Furthermore, the applied polymers (PMMA and Fluoropolymers, see e.g. column 9, line 50 and column 10, lines 11 – 13) have a high glass transition temperature and do not contain functional monomers. A high temperature is used (182 °C, see column 11, line 13) to melt the polymer and to form the thermoplastic layer. However, for the skilled person in the art it would not at all be obvious when starting at the Rinehart reference (resulting in a coating) to arrive at the present invention (resulting in adhering one substrate to another one). In particular, at room temperature, the Rinehart polymers are well below the glass transition temperature (PMMA has e.g. T_g's between 105 and 120°C) and can therefore be well processable in e.g. a fluidized bed powder coater. However, the polymer powders in the present invention are having either a much lower glass transition temperature of -60 to +40°C and/ or contain functional monomers, if they are synthetic polymers. It is much more critical to use such polymers, since they can either react readily or can become sticky much easier than high T_g polymers. Therefore, the skilled person in the art would not choose these types of material. Furthermore, it is advantageous to use much lower temperatures of just up to 120°C, compared to the 182°C of Rinehart. Accordingly, it is respectfully submitted that the new claims of the present application are patentable under 35 U.S.C. 103(a) over Rinehart.

Claims 3 and 6 were rejected as unpatentable under 35 U.S.C. 103(a) over Akasaki and optionally in view of WO 00/05275. Claims 3 and 6 have been cancelled. Akasaki discloses the

use of a Nylon copolymer (column 5, line 24) which is capable of becoming electrostatically charged using e.g. a corona discharge electrode, followed by applying heat to the applied polymer (140°C to 160°C, column 5, line 34) onto a fabric. However, the polymers disclosed in WO 00/05275 are cationic polymers, which are redispersible in an aqueous environment. In the present invention, they are activated by a fine mist of water. For the skilled person in the art it is in the light of Akasaki et al not obvious that also cationically charged polymers can be applied using the same method (e.g. corona discharge) as disclosed by Akasaki et al, since Nylon is a non-ionic polymer. Furthermore, the cationic polymers might behave very different in non-aqueous environment (or with just some minor amount of water such as water mist) due to repulsion of the cationic entities. Additionally, these polymers are applied to a different substrate (paper or plastic vs. fabric) and can be applied at lower temperature (120°C as defined in claim 1) than disclosed by Akasaki et al (140°C to 160°C, column 5, line 34). In view of these significant differences it is respectfully submitted that one skilled in the art would not be led to the present invention via Akasaki and WO 00/05275 and it is thus submitted that the new claims of the present invention are patentable over the cited references.

In view of the foregoing, it is respectfully submitted that the present application is in condition for allowance. If there are any issues that the Examiner wishes to discuss, he is invited to contact the undersigned attorney at the telephone number set forth below.

Respectfully submitted,

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Reference: Polymer Properties

Thermal Transitions of Homopolymers: Glass Transition & Melting Point

Literature values for the glass transition temperature, (Tg), and melting temperature, (Tm), are given in Table I for the more common homopolymers. Polymers are listed by the repeating unit in the polymer chain. These polymers and corresponding monomers are available from Aldrich. Literature values for a given material can vary widely. The values reported in Table I have been taken from various sources and represent the most commonly reported numbers.[1] Several factors can influence the reported values, including molecular weight, molecular weight distribution, tacticity, thermal history, purity, and method of measurement.

Table I: Thermal Transitions of Homopolymers: Glass Transition (T_g) & Melting Point (T_m) Temperatures

Repeating Unit	T_g (°C)	T_m (°C)	Repeating Unit	T_g (°C)	T_m (°C)
Acenaphthylene	214		N,N-Dimethylacrylamide	89	
Acetaldehyde	-32	165	Dimethylaminoethyl methacrylate	19	
4-Acetoxystyrene	116		2,6-Dimethyl-1,4-phenylene oxide	167	
Acrylamide	165		Dimethylsiloxane	-127	-40
Acrylic acid	105		2,4-Dimethylstyrene	112	
Acrylonitrile, syndiotactic	125	319	2,5-Dimethylstyrene	143	
Allyl glycidyl ether	-78		3,5-Dimethylstyrene	104	
Benzyl acrylate	6		Dodecyl acrylate	-3	
Benzyl methacrylate	54		Dodecyl methacrylate	-65	
Bisphenol A-alt-epichlorohydrin	100		Dodecyl vinyl ether	-62	
Bisphenol A terephthalate	205		Epibromohydrin	-14	
Bisphenol A carbonate	174		Epichlorohydrin	-22	
Bisphenol F carbonate	147		1,2-Epoxybutane	-70	
Bisphenol Z carbonate	175		1,2-Epoxydecane	-70	
4-Bromostyrene	118		1,2-Epoxyoctane	-67	
cis-Butadiene	102	1	2-Ethoxyethyl acrylate	-50	
trans-Butadiene	-58	148	4-Ethoxystyrene	86	
1-Butene	-24	171	Ethyl acrylate	-24	
N-tert-Butylacrylamide	128		Ethyl cellulose	43	
Butyl acrylate	-54		Ethylene, HDPE	-125	130
sec-Butyl acrylate	-26		Ethylene adipate	-46	54
tert-Butyl acrylate	43-107	193	Ethylene-trans-1,4-cyclohexyldicarboxylate	18	–
2-tert-Butylaminoethyl methacrylate	33		Ethylene isophthalate	51	
Butyl glydicyl ether	-79		Ethylene malonate	-29	
Butyl methacrylate	20		Ethylene 2,6-napthalenedicarboxylate	113	
tert-Butyl methacrylate	118		Ethylene oxide	-66	66
4-tert-Butylstyrene	127		Ethylene terephthalate	72	265
tert-Butyl vinyl ether	88	250	2-Ethylhexyl acrylate	-50	
Butyl vinyl ether	-55	64	2-Ethylhexyl methacrylate	-10	
ε-Caprolactone	-60		2-Ethylhexyl vinyl ether	-66	
Cellulose nitrate	53		Ethyl methacrylate	65	
Cellulose tripropionate			Ethyl vinyl ether	-43	86
cis-Chlorobutadiene	-20	80	4-Fluorostyrene	95	
trans-Chlorobutadiene	-40	101	Formaldehyde	-82	181
2-Chlorostyrene	119		Hexadecyl acrylate	35	
3-Chlorostyrene	90		Hexadecyl methacrylate	15	
4-Chlorostyrene	110		Hexyl acrylate	57	
Chlorotrifluoroethylene	52	214	Hexyl methacrylate	-5	
2-Cyanoethyl acrylate	4		2-Hydropropyl methacrylate	76	
Cyclohexyl acrylate	19		Hydroquinone-alt-epichlorohydrin	60	
Cyclohexyl methacrylate	92		2-Hydroxyethyl methacrylate	57	
Cyclohexyl vinyl ether	81		Indene	85	
2,6-Dichlorostyrene	167		Isobornyl acrylate	94	
Diethylaminoethyl methacrylate	20		Isobornyl methacrylate	110	

[1]See catalog numbers Z41,347-1, Z41,234-1, Z22,171-1, Z40,603-1 and Z22,105-3 in the Book section.

Reference: Polymer Properties

Thermal Transitions of Homopolymers: Glass Transition & Melting Point (continued)

Table I: Thermal Transitions of Homopolymers: Glass Transition (T_g) & Melting Point (T_m) Temperatures (continued)

Repeating Unit	T_g (°C)	T_m (°C)	Repeating Unit	T_g (°C)	T_m (°C)
Isobutyl acrylate	-24		p-Phenylene terephthalamide	345	
Isobutylene	-73		Phenylene vinylene	80	380
Isobutyl methacrylate	53		Phenyl methacrylate	110	
Isobutyl vinyl ether	-19	165	Phenyl vinyl ketone	74	
cis-Isoprene	-63	28	Potassium acrylate	194	
trans-Isoprene	-66	65	Propylene, atactic	-13	
N-Isopropylacrylamide	85-130		Propylene, isotactic	-8	176
Isopropyl acrylate, isotactic	-11	162	Propylene, syndiotactic	-8	
Isopropyl methacrylate	81		Propylene oxide	-75	66
Methacrylic acid	228		Propyl vinyl ether	-49	76
Methacrylic anhydride	159		Sodium acrylate	230	
Methacrylonitrile	120		Sodium methacrylate	310	
2-Methoxyethyl acrylate	-50		Styrene, atactic	100	
4-Methoxystyrene	113		Styrene, isotactic	100	240
Methyl acrylate	10		Tetrabromobisphenol A carbonate	157	
Methyl cellulose			Tetrafluoroethylene	117	327
Methyl glycidyl ether	-62		Tetrahydrofuran	-84	
Methyl methacrylate, atactic	105,120		Tetramethylene adipate	-118	
Methyl methacrylate, syndiotactic	115	200	Tetramethylene terephthalate	17	232
4-Methylpentene	29	250	Thio-1,4-phenylene	97	285
Methylphenylsiloxane	-86		2,2,2-Trifluoroethyl acrylate	-10	
Methylstyrene	20		Trimethylene oxide	-78	
3-Methylstyrene	97		Trimethylsilyl methacrylate	68	
4-Methylstyrene	97		2,4,6-Trimethylstyrene	162	
Methyl vinyl ether	-31	144	Vinyl acetal	355	82
Nylon 4,6 (tetramethylene adipamide)	43		Vinyl acetate	30	
Nylon 6 (-caprolactam)	52	225	Vinyl alcohol	85	220
Nylon 6,6 (hexamethylene adipamide)	50	265	Vinyl benzoate	71	
Nylon 6,9 (hexamethylene azelamide)	58		Vinyl 4-tert-butylbenzoate	101	--
Nylon 6,10 (hexamethylene sebacamide)	50	227	Vinyl butyral	322	49
Nylon 6,12 (hexamethylene dodecane-diamide)	46		Vinyl carbazole	227	320
			Vinyl chloride	81	227
Nylon 11 (ω-undecanamide)	42	189	Vinyl cyclohexanoate	76	
Nylon 12 (ω-dodecanamide)	41	179	Vinylferrocene	189	
1-Octadecene	55		Vinyl fluoride	41	200
Octadecyl methacrylate	-100		Vinyl formal	105	
1-Octene	-63		Vinylidene chloride	-18	200
Octyl methacrylate	-20		Vinylidene fluoride	-40	171
Oxy-4,4'-biphenyleneoxy-1,4-phenylenesulfonyl-1,4-phenylene	230	290	2-Vinyl naphthalene	151	
			Vinyl pivalate	86	
Oxy-1,4-phenylenesulfonyl-1,4-phenyleneoxy-1,4-phenyleneisopropylidene-1,4-phenylene	165	190	Vinyl propionate	10	
			2-Vinylpyridine	104	
Oxy-1,4-phenylenesulfonyl-1,4-phenylene ether	214	230	4-Vinylpyridine	142	
			1-Vinyl-2-pyrrolidone	54	
p-Phenylene isophthalamide	225	380	Vinyl trifluoroacetate	46	